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Rigs-to-Reefs

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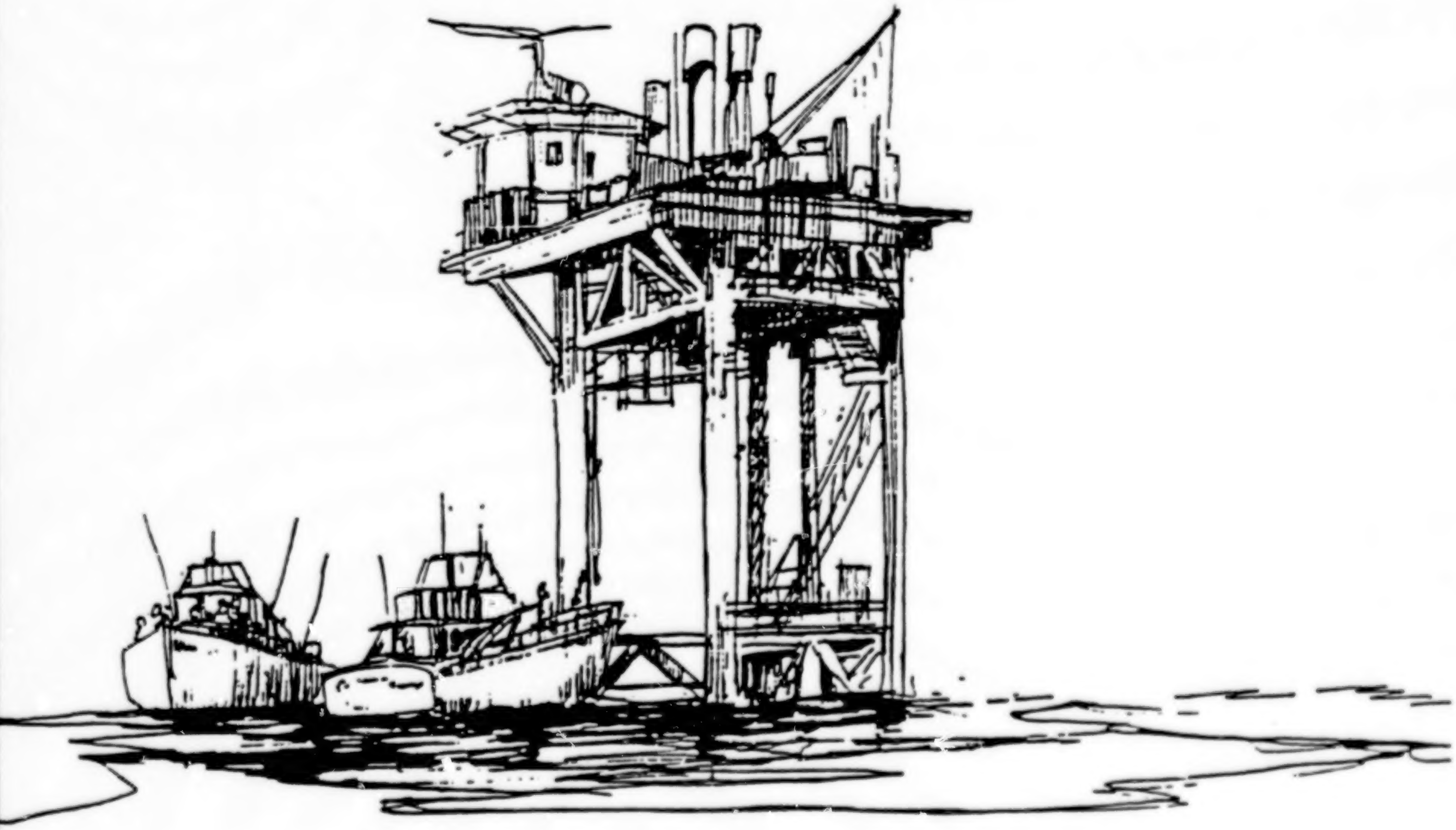
The Use of Obsolete Petroleum Structures As Artificial Reefs



U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

OCS Report
MMS 87-0015

Rigs-to-Reefs

The Use of Obsolete Petroleum Structures As Artificial Reefs

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U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

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Rigs-to-Reefs

Rigs-to-Reefs is a catchy term for converting obsolete, nonproductive offshore oil and gas structures (platforms and rigs) to designated artificial reefs. The concept has been around for a long time; however, it is only in the last few years that broad public and private support for the idea has emerged. Government and industry have begun to look at the opportunities and problems associated with a planned, cooperative, and systematic approach to improving offshore fishing by developing artificial reefs from oil and gas structures.

The Road to a National Policy

Since the inception of the Federal offshore leasing program in 1954, the Gulf of Mexico OCS Region has led the nation in offshore energy production (USDI, MMS, 1986) and has retained its pre-eminence in offshore fishery production (USDC, NMFS, 1986). Although broad comparisons over the years in the Gulf region have shown no consistent trends or direct relationships between gross production figures within the contiguously operating petroleum and fisheries industries (Reggio, 1983), more focused studies on the direct effect of offshore petroleum structures on specific user groups would indicate otherwise. In recent years, offshore energy development off the coasts of Louisiana and Texas has been recognized as having a significant direct effect on offshore recreational fishing, commercial hook-and-line fishing, and scuba diving (Ditton and Auyong, 1984; Roberts and Thompson, 1983; Caldwell, 1982; Ditton and Graefe, 1978). Scientists (Gallaway and Lewbel, 1982; Sheehy and Vic, 1982) and technical journalists (Littleton, 1986; Brundage, 1984; Bleakley, 1982) have speculated favorably on the adaptability, suitability, and wisdom of the Rigs-to-Reefs concept. Leading fishery administrators have also commented favorably on the multiple-use value and fisheries enhancement potential of oil and gas structures (Sullivan, 1983, 1984, and 1985; Harville, 1983; Radonski, 1983).

Faced with growing interest in the concept and increasing documentation on the positive value of oil and gas structures for fishery enhancement and development, the Secretary of the Interior in 1983 joined with the president of the National Ocean Industries Association to form the Recreational, Environmental Enhancement for Fishing in the Seas (REEFS) task force. Composed of marine fishery representatives from coastal states and public and private officials concerned and responsible for ocean development and conservation, the task force set out to develop a strategy which would lead to the creation of a national artificial-reef policy, plan, and program in the United States. That objective was appreciably advanced on November 8, 1984, when President Reagan signed into law the National Fishing Enhancement Act (NFEA) of 1984 (Title II of P.L. 98-623). Without a national artificial-reef policy, a concerted Federal effort at perpetuating and expanding the artificial-reef benefits of obsolete petroleum structures would not have been possible.

In the NFEA, Congress recognized the social and economic value in developing artificial reefs, established national standards for artificial-reef developments, called for creation of a National Artificial-Reef Plan under the leadership of the Department of Commerce, and established a reef permitting system under the U.S. Army Corps of Engineers that limits the liability of participants in the program. The law strongly encourages the development of artificial reefs, but authorizes no direct appropriations for administration, planning, construction, enforcement, monitoring, or research on artificial reefs. Congress clearly intended that artificial reef support and development be accomplished through existing Federal programs in conjunction with public and private cooperation leading to the use of materials of opportunity. The law also calls for an evaluation of incentives likely to encourage private sector support for artificial-reef development. The National Artificial-Reef Plan (USDC, NMFS, 1985) lists specific materials and design standards which include oil and gas structures among recommended materials of opportunity.

Oil and Gas Structures as Artificial-Reef Material

The Gulf of Mexico now has over 4,000 oil and gas production platforms in State and Federal waters reaching depths over 1,000 feet and extending more than 130 miles from shore. These structures represent over 99 percent of our nation's offshore oil and gas platforms. Most of these platforms are off Louisiana (3,600 structures) and in Federal waters (3,155 structures). Gallaway (1984) determined that these structures constitute 28 percent of the known hard-bottom habitat off the coasts of Louisiana and Texas.

Louisiana and Texas private- and charter-boat owners and scuba divers have followed the development of these structures out to depths of several hundred feet. Catches have been consistently reported in terms of the number of ice chests filled and hundreds of pounds harvested. Data (Witzig, 1986) from the National Marine Fisheries Service's (NMFS) 1984 Marine Recreational Fishery Statistics Survey for the Gulf of Mexico indicates 37 percent of all saltwater fishing trips made by Louisiana coastal residents in 1984 were to oil and gas structures. Furthermore, over 70 percent of all recreational fishing trips in the Fishery Conservation Zone (more than 3 miles from shore) off Louisiana is in direct association with oil and gas structures. The prevalence rate for offshore fishing trips near petroleum structures in Louisiana was highest among party/charter-boat fishermen. One of Louisiana's oldest, most experienced, and successful charter-boat captains, who takes approximately 10,000 people fishing every year, makes no secret that his business has grown and prospered as a direct result of the proliferation of offshore oil and gas structures (Hardison, 1982).

The NMFS also has been tracking offshore charter-boat catch rates, or fishing success, in a Gulf and South Atlantic charter-boat survey since 1982. Initial results from its published data (Brusher et al., 1984) and regular monthly reports indicate overall success rates for recreational fishing from charter-boats off the coast of Louisiana (where most of the effort is directly associated with producing oil and gas structures) consistently and significantly exceed all other Gulf and South Atlantic States. As confirmed by survey results produced independently by the NMFS, offshore rig fishermen from Louisiana catch more fish, bigger fish, and consistently more desirable fish than those marine fishermen focusing their efforts at all other locations.

The oldest (20-30 years), most well established, and highly recognized fishing platforms are those within 25 miles of shore in water depths less than 200 feet. These are the same structures where most of the oil and gas resources are becoming rapidly depleted, and therefore have the shortest life expectancy. Information resulting from a comprehensive national study on platform disposition by the National Research Council (1985) indicates that by the year 2000, just 13 years down the road, two-thirds of the existing offshore structures will have become commercially unproductive and will have had to be removed for onshore disposal. An average of over 100 oil and gas platforms may be scheduled for removal each year for the next 20 years. The size, shape, design, and profile of major petroleum structures encompass the most desired features for productive artificial fishing reefs. The density and openness of petroleum structures put them among the most stable and durable reusable material readily available for permanent artificial-reef construction.

The cost for removing an individual structure will range from hundreds of thousands to tens of millions of dollars, depending on size, location, and water depth. Assuming the artificial-reef program in the Gulf of Mexico could effectively utilize only one-half of the existing offshore structures, and the average cost of removing those structures would be $2,000,000, then 2,000 structures and $4 billion can potentially be directed to artificial-reef developments and for fishery enhancement projects instead of the trash pile.

As it is rarely feasible to reuse obsolete structures for oil and gas operations, and the scrap value barely pays for shore-based dismantling and disposal, most of the removal costs for obsolete oil and gas platforms are irretrievable. The oil and gas industry is anxious to cooperate with responsible reef developers willing and able to accept future responsibility and liability for Rigs-to-Reefs projects, and will probably devote a major portion of disposal savings to supporting artificial-reef development projects (Zagata, 1986; DuBose, 1984; Larson, 1984).

It can be argued that we all share in obsolete platform disposal costs one way or another, as they are subtracted from profits before taxes. The loss of these structures without a full evaluation of their potential use in the national-artificial-reef program is unlikely to be in the national interest. As the rights and interests of citizens and especially other ocean users must be considered, it is essential in a national artificial-reef planning process to find the most suitable sites and the best ways and means to convert obsolete petroleum structures to permitted artificial reefs. The givers, the takers, and the users must all benefit to the maximum extent possible. If the benefits of Rigs-to-Reefs projects are mutually shared by all affected ocean users, the program is more likely to succeed.

Most Gulf States have expressed a strong desire to acquire oil and gas structures in their reef development programs (Barrett, 1984a; Frishman, 1982; Perret, 1985; Swingle, 1984), and several ongoing comprehensive planning projects at the regional and state levels should identify the most appropriate sites (McGurrin and Reeff, 1986; Wilson, 1985; Jones, 1984). In the past, government has reacted to industry's initiatives by planning for the utilization of offered structures on a project-by-project basis. Hopefully, in the future, the oil and gas industry can react in their disposal-planning to established fishery development needs resulting from comprehensive artificial-reef-planning programs.

Demonstration Projects

Several projects serve as prototype or demonstration projects for artificial reefs. The State of Florida, through local governments and private interests, now has over 100 permitted artificial reefs in the Gulf of Mexico. These reefs are comprised of everything from junked cars to surplus government ships. Floridians are the nation's most prolific artificial-reef builders. Although some early projects met with limited success, research, site planning, regulation, experience, and interagency cooperation have made artificial-reef development in that state a successful, growing, and increasingly proficient program. Overall, there have been about 125 artificial-reef projects permitted throughout the Gulf of Mexico off the States of Florida, Alabama, Mississippi, and Texas. Louisiana, which fortuitously has the most productive *de facto* artificial-reef system in the United States, enacted legislation in June of 1986 (Act 100 — The Louisiana Fishing Enhancement Act) authorizing a State-directed artificial-reef program. Louisiana intends to develop and implement a plan that will salvage fishery benefits currently associated with oil and gas structures (Reggio, Van Sickle, and Wilson, 1986).

Beginning in 1980 with Exxon's donation of a prototype submerged-production system template to the State of Florida for an artificial reef (Barrett, 1984b), six oil and gas structures have been deployed on four planned artificial-reef sites. Tenneco, in 1983, donated the jacket and decking components of a 500-ton production platform removed from off Louisiana for the establishment of a new reef in 175 feet of water 22 miles off Pensacola. Again, in 1985, Tenneco retired, transported over 900 miles, and deployed portions of three former production platforms to create Florida's largest artificial reef at a nearshore location near Miami and Ft. Lauderdale (Zagata, 1986). Alabama permitted a reef site 50 miles south of Mobile Bay in 240 feet of water to receive a former production platform donated by Marathon Oil Company in 1983 (Swingle, 1984). A new and innovative flotation technology was utilized to remove and transport Marathon's structure to its designated reef site (Dominguez, 1983). Additionally, three drilling rigs sunk during oil and gas operational accidents were permitted as artificial reefs by private interests off the coast of Texas between 1977-1983 (Littleton, 1986).

Two U.S. Navy research structures resembling oil- and gas-production platforms in shape and design were dismantled on site in 1984 for use as permanent artificial reefs (Seelig, 1984). Like the active petroleum structures off Louisiana, the Navy's platforms, located just 3 and 12 miles from the beach at Panama City, had become very popular fishing locations over their 25 years as functioning research structures. The Navy, in considering disposal options for these obsolete structures, assessed and accommodated Bay County's interest in creating two permanent artificial reefs.

The cost for establishing the six described Rigs-to-Reefs projects off the coasts of Florida and Alabama was reported to range between $1-5 million each (Christian, 1984). Projects involving interstate transport of oil and gas structures cost the donating companies as much, or more, than other disposal options available to them.

Construction Options for Converting Rigs-to-Reefs

When a petroleum company or offshore lease operator can no longer produce commercial quantities of oil and gas from a production platform, all existing wells are plugged and abandoned according to Minerals Management Service (MMS) regulations. The MMS is the federal agency which has responsibility for all oil and gas operations in federal waters. Reusable and disposable equipment, facilities, and supplies are then removed. Generally, all that remains of a platform prior to disposal are the submerged platform support jacket and the superstructure, consisting of one to three decks and a heliport. Although the superstructure can add valuable surface area to a benthic reef, it is the platform jacket, or underwater support structure, that is most inherently suitable for artificial-reef development.

Historically, about 400 offshore platforms have been totally removed from U.S. offshore locations at considerable economic and environmental cost. Below are five basic alternatives to removal from the marine environment. Each involves the conversion of abandoned structures to designated, high profile, artificial reefs; each has advantages and disadvantages, depending on location and perspective.

Structures Left in Place

For the fishermen, a structure left in place is generally the most favored option, because the reef would continue to be easy to locate and convenient to fish. This option does not disrupt the established biological community and takes maximum advantage of the entire water column, providing a more diversified fishery. If the decking remains attached above the water (optional), it provides a source of refuge for the fishermen in emergency situations. The superstructure or decking also has the potential for facilitating fishery development, research, or future commercial ventures. Conversely, it can be an attractive nuisance or a navigation hazard contributing to future liability concerns. From the standpoint of the project sponsor (artificial-reef permittee), the cost of maintenance (structure and navigation aids), as well as liability protection, would be highest under this option. Responsibility would have to be assumed for partial or total removal, or for toppling the structure at some future date if cathodic (corrosion) protection is not maintained. From the lease operator's or oil company's point of view, this is the most economically feasible option, assuming the company would be totally relieved of all future costs and responsibilities for operation, maintenance, liability and removal, upon transfer of title. In Federal waters or the U.S. Fishery Conservation Zone (FCZ), this option may require an exception from MMS lease clearance requirements, in addition to a Corps of Engineers Section 10 permit authorized by Section 205 of the NFEA. International law and pending Federal agreement on artificial reefs may further restrict consideration of this option to State territorial waters or Federal waters of depths less than 66 feet. Generally, this option would not be economically practical or legally advisable, except in unique situations or in very high-use areas that are most likely to be located nearshore and close to primary coastal boating access areas associated with major coastal fishing populations. Intense mariculture, or fishery research or support operations in particularly suitable locations, might also warrant consideration of this option.

Structures Partially Removed

The option of partially removing structures would entail removing the superstructure and top portion of the platform jacket to a depth prescribed for safe navigation clearance. The superstructure and jacket top might be used productively to expand the lateral, benthic portion of the reef. Construction can seriously or minimally affect the existing biological community, depending on methods used, but effects should be temporary. This is an effective reef development option from the recreational fisherman's standpoint, if it is marked on site with bouys, mapped, and located within a reasonable distance from shore and safe harbor. The reef sponsor's concern and cost for liability should be significantly diminished under this option; however, private aids to navigation involving an expensive long-term maintenance commitment may be required and desirable to mark the location of the site. Partial removal is economically advantageous to the lease operator, who is likely to support such proposals, assuming that all Federal clearances, endorsements, and permits were granted, and that the sponsor assumed all future maintenance and liability costs. The economic incentive for industry to support this alternative, as with all lease-site-structure retention options, increases with water depth. Partial removal is also very advantageous to reef stability, because the anchoring system designed to maintain the entire original structure for all expected oceanographic and weather conditions would be retained. Should the removed sections be made part of the reef, and characteristics of the site or conditions of the reef permit warrant supplemental anchoring devices, the top portion could be shackled to the anchored base of the remaining jacket left standing underwater. Partial removal provides some flexibility in reef configuration, depending on use of removed portions and supplemental materials. This option is suitable for all depths where reefs might be built, but is most suitable for shallow to midwater and over soft-bottom areas where stability and profile may be an issue. Implementation of this option, as with all on-site retention options, assumes fishery development and hook-and-line fishing are the best long-term commitment of the site in question, and that an eligible sponsor is willing to secure the Corps of Engineers reef permit and be responsible for the reef. The Navy's demolition-reef development projects off Panama City, Florida, are examples of this option.

Structures Toppled on Location

Toppling structures on location entails removing the entire structure from its vertical moorings but retaining the structure on site in a lateral orientation. The established biological community would be seriously but temporarily impacted during reef construction; however, survivors and new recruits would quickly reestablish and repopulate the remaining benthic and midwater portions of the reef. The loss of vertical structural profile will be compensated for by the extension of the "footprint," that is, the horizontal areal extent of the reef. Depending on location, bottom depth, clearance from the top of the reef to the water surface, mapped references, and surface markings, a toppled-structure reef could be valued for both commercial and recreational fishing. The enlarged footprint associated with toppling will favor expansion of snapper, grouper, and ground fish populations. The fishing capacity of the reef will also expand, assuming it can be located and accessed by fishermen. Where location justifies permanent artificial-reef dedication (approvals and sponsorship apparent), it would be economically advantageous for the lease operator to cooperate in establishing the reef. Toppling is considered most suitable for water depths greater than 150 feet. The Topper III and Penrod 52 drilling rig accidents off Texas are two unplanned versions of this type of artificial-reef development.

Structures Removed and Relocated

Another option is to totally remove and relocate an obsolete structure in one or more pieces to a permitted artificial-reef site. Relocation would cause the total destruction of an artificial reef and associated biological community in one place, but would lead to the development of a new reef, presumably in a more favorable location. This option should strongly favor fishermen, as the expense and trouble associated with the removal, transportation, and permitting requirements should hardly be warranted without the anticipation of major fishing benefits. Project sponsors are likely to strongly endorse this option on suitably permitted sites as long as transportation and deployment are guaranteed by the oil company. Relocation is the least attractive alternative to the oil industry because the expense involved is likely to approximate or greatly exceed onshore disposal and scrap salvage, depending on travel distance and deployment requirements. This option is most suitable and feasible for deepwater sites (more than 150 ft) because the added expense associated with major jacket modifications is reduced. The Exxon, Tenneco, and Marathon demonstration projects are three successful examples of this option. Although the potential for maximizing the fishery enhancement benefits of the existing 4,000 offshore oil and gas structures is tied to gross application of this option, it is not economically feasible under current financial practices and is likely to occur only within limited proximity to existing structures. Should project sponsors be willing to pay the additional transportation cost above that associated with onshore disposal, or should special financial or other incentives be established, as called for in Part 6, Section 204 of the NFEA, a broader application of Rigs-to-Reefs under this option would likely occur.

Combinations or Artificial-Reef Complexes

The most innovative, creative, and effective application of the Rigs-to-Reefs concept involves a combination or clustering of several of the above options. One or several highly fished structures could be left in place as refuge, support, and marking stations, and a series of partially removed or relocated structures could be added in patterns designed to maximize the function of an extended artificial reef. Suggestions have been made, for example, to leave one large structure standing as the center of an array of horizontal platforms jackets like spokes on a wheel. Others have suggested leaving two major structures marking the extremities of a reef extending a mile or more apart in an obsolete oil and gas field and leaving partially removed, toppled, and relocated obsolete structures between the two. Such a pattern could extend and diversify the fishery (trolling and bottom fishing) and accommodate many fishing boats simultaneously. The Buccaneer Field off Galveston-Freeport, Texas, is one area where application of such a concept has been suggested and studied (Branton, 1984). Still another concept, currently permitted 80 miles off the Texas coast, is the establishment of a large (one square mile) deepwater permit area in the center of a major oil and gas field. Commercial fishing and benefits currently associated with over 200 structures within a 50-mile radius would gradually be concentrated into the one-square-mile permit area.

In the years ahead more sophisticated research is needed to answer questions like: What is the most ideal geometric pattern, spacing, or configuration of obsolete oil and gas structures to meet defined fishery enhancement purposes? At what point, if any, does adding obsolete structures to a large, deepwater reef cease to augment fishery benefits and start to become clutter or mere dumping? As in the case of offshore energy development itself, the costs associated with developing artificial reefs with oil and gas structures are astronomical and of orders of magnitude greater than traditional reef development projects in this country. We can, however, evaluate the payoff where structures already exist, before making the reef commitment by analyzing associated use-patterns and fish communities prior to permitting.

The MMS has adopted a policy aimed at encouraging the use of obsolete petroleum structures for fishery development. We are evaluating and updating our regulations and procedures and will cooperate with intradepartmental initiatives designed to allow sanctioned reef builders the maximum flexibility possible in capturing the inherent fisheries enhancement value of oil and gas structures (Krahl, 1986).

The opportunity for making a significant contribution to the purpose of the NFEA by salvaging and expanding the potential fishery enhancement benefits currently associated with offshore oil and gas platforms in the Gulf of Mexico is enormous. Oil and gas structures should be viewed as national resources that can keep producing public benefits long after the oil and gas are gone. Although privately owned, the cost — financial and environmental — to remove these structures for onshore disposal is a cost in which we all will share.

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